MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2016/2017

BMM 1014 – MATHEMATICS FOR MANAGERS

(All Sections / Groups)

26 MAY 2017
3.00 p.m - 5.00 p.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 7 pages with 5 questions only.
2. Attempt any **FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.
4. Formulae are attached at the end of the question paper.

QUESTION 1

(a) Axus Sdn Bhd, a tablet manufacturer, has a yearly fixed cost of RM4,500,000 and a production cost of RM1300 for each tablet manufactured. The tablets sell for RM1859 each.

(i) Find the yearly break-even quantity of Axus Sdn Bhd. (3 marks)

(ii) Find the profit or loss of the company if the company manages to sell 2000 tablets? (3 marks)

Now suppose that the increased in material cost has raised the variable cost to RM1550 per tablet and fixed cost increase to RM4,800,000.

(iii) Find the new break-even level of the company. (3 marks)

(iv) If the company expects to be able to sell 12,000 tablets, what price should be charged in order to break even? (3 marks)

(b) A bicycle factory manufactures three models of bicycles, models A, B, and C. Each model A bicycle requires 600 minutes of cutting, 60 minutes of assembly, and 60 minutes of finishing. Each model B bicycle requires 120 minutes of cutting, 540 minutes of assembly, and 60 minutes of finishing. Each model C bicycle requires 120 minutes of cutting, 180 minutes of assembly, and 300 minutes of finishing. There are 2820 hours available each month in the cutting department, 1610 hours in the finishing department, and 2390 hours in the assembly department. How many bicycles of each model should be manufactured each month if all available time is used?

(13 marks)

(Total: 25 marks)

Continued...

QUESTION 2

The seasonal yield of olives in a Piraeus, Greece, vineyard is greatly influenced by a process of branch pruning. If olive trees are pruned every two weeks, output is increased. The pruning process, however, requires considerably more labor than permitting the olives to grow on their own and results in a smaller size olive. It also, though, permits olive trees to be spaced closer together. The yield of 1 barrel of olives by pruning requires 5 hours of labor and 1 acre of land. The production of a barrel of olives by the normal process requires only 2 labor hours but takes 2 acre of land. An olive grower has 250 hours of labor available and a total of 150 acres for growing. Because of the size difference, a barrel of olives produced on pruned trees sells for RM 20, whereas a barrel of regular olives has a market prices of RM 30. The grower has determined that because of uncertain demand, maximum 40 barrels of pruned olives should be produced.

(a) Formulate the above problem as a Linear Programming problem.

(5 marks)

(b) Graph the above information in part (a) into a suitable diagram and shade the feasible region clearly.

(6 marks)

(c) Find the optimal solution and the associated maximum total profit.

(11 marks)

(d) What would be the effect on the optimal solution if the market price of the regular olives has increased from RM 30 to RM 50?

(3 marks)

(Total: 25 marks)

Continued...

QUESTION 3

(a) How many days will it take for an amount of RM 100,100 to yield RM 1,500 as interest at 7.55% per annum of simple interest? (Assumes that each year has 360 days)

(4 marks)

(b) What is the difference between the compound interests on RM 3,969 for $2\frac{1}{2}$ years at 6.24% compounded yearly and half-yearly?

(8 marks)

(c) If RM10,500 is deposited in a saving account that earns interest at an annual rate of 7.7% compounded continuously, what is the value of the account at the end of twelve years?

(4 marks)

(d) In April 2017, the average rate for a 30-year fixed mortgage was 4.43%. Assume a down payment of 20% on a home purchase of RM300,900.

(i) What will be the monthly payment?

(5 marks)

(ii) After 5 years, approximately how much is owed on the mortgage?

(4 marks)

(Total: 25 marks)

Continued...

QUESTION 4

(a) Find the derivative of each function.

(i) $f(x) = 2e^{3x} + 7x$

(4 marks)

(ii) $f(x) = (2x^3 - 12x^2 + 3)$

(2 marks)

(b) Gigi Company has started selling a new type of speaker. The demand equation for a new brand X speaker for this year is given by

$$p = \frac{1}{12}x^2 - 7.5x + 125$$

$0 \leq x \leq 30$. Find the value of x (in unit) and the corresponding price p (in RM) that maximize the revenue.

(7 marks)

(c) Aukey Company has started selling a new type of hard disk at the price of RM $(400 - 0.5x)$ where x is the number of hard disks manufactured per day. The parts for each hard disk cost RM 50 and the labour and overhead for running the plant cost RM 5000.

(i) Find the revenue function R and the profit function P.

(5 marks)

(ii) Find the marginal cost function, the marginal revenue function, and the marginal profit function.

(3 marks)

(iii) Determine the level of production that maximize the profits. What is the maximum profit?

(4 marks)
(Total: 25 marks)

Continued...

QUESTION 5

(a) Find the indefinite integral $\int 9x^8\sqrt{10-x^9}\,dx$

(5 marks)

(b) As part of a quality-control program, the perfume sets manufactured by Boss Company are subjected to a final inspection before packing. The rate of increase in the number of sets checked per hour by an inspector t hours into the 6 A.M. to 11 A.M. morning shift is given by

$$N'(t) = -9t^2 + 240t + 80 \qquad (0 \le t \le 5)$$

How many sets does the average inspector check during a morning shift?

(5 marks)

(c) A Happy Festival promoter produces two types of pewters; type A sells for \$25, and type B sells for \$50. The total revenue (in thousands of RM) is given by

$$R(x,y) = 25x + 50y$$

and the total cost (in thousands of RM) of producing these pewters is given by

$$C(x,y) = 10x^2 - 6xy + 1.5y^2 - 19x + 56y - 20$$

where x denotes thousand pewters of type A and y denotes thousand pewters of type B produced and sold. How many of each type of pewters must be produced and sold in order to maximize profit? What is the maximum profit realizable?

(15 marks)

(Total: 25 marks)

Continued...

LIST OF FORMULA

1. Quadratic Formula

The solution of the equation:
$ax^2 + bx + c = 0$,
$a \neq 0$, are $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

2. Simple Interest

Interest, $I = Prt$ (P = principal, r = interest rate, t = number of years)
Accumulated amount, $A = P(1 + rt)$

3. Compound Interest

Accumulated amount, $A = P(1 + i)^n$, where $i = r/m$, and $n = mt$ (m = number of conversion periods per year)

4. Continuous Compound Interest

$A = Pe^{rt}$

5. Effective Rate of Interest

$r_{eff} = (1 + r/m)^m - 1$

6. Present Value for Compound Interest

$P = A(1 + i)^{-n}$

7. Future Value of an Annuity

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

(S = future value of ordinary annuity of n payments of R dollars periodic payment)

8. Present Value of an Annuity

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

(P = present value of ordinary annuity of n payments of R dollars periodic payment)

Continued...

9. Amortization Formula

$$R = \left[\frac{Pi}{1-(1+i)^{-n}} \right]$$

(R = periodic payment on a loan of P dollars to be amortized over n periods)

10. Sinking Fund Formula

$$R = \left[\frac{Si}{(1+i)^{n}-1} \right]$$

(R = periodic payment required to accumulate S dollars over n periods)

11. Break-even point = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}}$ (Contribution per unit = unit selling price – unit variable cost)

Sales (unit) = $\frac{\text{Fixed cost + Target profit}}{\text{Contribution per unit}}$

Calculus

12. Product rule

$$f(x) = u(x).v(x)$$

$$f'(x) = u(x).\frac{dv}{dx} + v(x).\frac{du}{dx}$$

13. Quotient rule

$$f(x) = \frac{u(x)}{v(x)}$$

$$f'(x) = \frac{v(x)\frac{du}{dx} - u(x)\frac{dv}{dx}}{[v(x)]^2}$$

End of Paper